

IN THE US PATENT & TRADEMARK OFFICE

APPLICANT: Alexander HAHN
SERIAL #: 10/ 671,909 ATT'Y DOCKET: 870-003-161
FILED: 25 SEP. 2003
TITLE: APP. FOR SENSING THE ABSOLUTE-VALUE ANGLE OF A SHAFT
EXAMINER: David SCHINDLER ART UNIT: 2862

AMENDMENT IN RESPONSE TO OFFICE ACTION OF 16 JUN. 2006

Commissioner for Patents
PO BOX 1450
ALEXANDRIA VA 22313

Sir:

Responsive to the Quayle Action of 16 JUN. 2006, the
3-month extended term for response to which expires MONDAY,
18 DEC. 2006, please amend as follows:

IN THE CLAIMS:

CERTIFICATE OF EFS-WEB FILING

The undersigned hereby certifies that this document has been
transmitted via EFS-WEB on MONDAY, 18 DEC. 2006.

/Milton M. Oliver/
Milton Oliver, Reg. # 28,333
CUST. NO. 004955

1. (Currently Amended) An apparatus for sensing the absolute value of the rotational position of a shaft, said apparatus comprising:

- a) a first single-turn rotary encoder arranged at one end of the shaft and configured to sense the shaft's rotational position within a single revolution thereof, said first single-turn rotary encoder being circumscribed by an outer periphery;
- b) a second rotary encoder unit for sensing the number of revolutions of said shaft, said second rotary encoder unit comprising:
 - i) a reduction gear linkage drivable by the shaft and being arranged annularly around a portion of the shaft, said reduction gear linkage having an output element, driving motion applied by the shaft (14) to the reduction gear linkage (18) translating into a motion coaxial with motion of the shaft;
 - ii) a rotary element connected to said output element, said rotary element being located beyond said one end of the shaft but along a common axis therewith;
 - iii) a second single-turn rotary encoder configured to sense the rotational position of said rotary element within a single revolution thereof; and
 - iv) an essentially U-shaped yoke connecting member for drivingly connecting said output element of the reduction gear linkage to said rotary element, said connecting member extending around the outer periphery of the first single-turn rotary encoder.

2. (Currently Amended) The apparatus according to claim 14 ~~±~~, wherein driving motion applied by the shaft (14) to the reduction gear linkage (18) translates into a motion coaxial with motion of the shaft.

3. (Currently amended) The apparatus according to claim 14 ~~2~~, wherein the connecting member comprises an essentially U-shaped yoke (40).

4. (Previously presented) The apparatus according to claim 1, wherein

the first single-turn rotary encoder (30) comprises a first sensor (26) and a first permanent magnet (22) coaxing therewith, said first permanent magnet (22) being arranged on an end face of the shaft (14).

5. (Currently amended) The apparatus according to claim 1 ~~4~~, wherein

the first sensor comprises a giant magneto-resistive (GMR) sensor (26).

6. (Currently amended) The apparatus according to claim 1 ~~4~~, wherein the second single-turn rotary encoder (48) comprises a second sensor (46) and a second permanent magnet (44) coaxing therewith, the second permanent magnet being arranged on the rotary element (42).

7. (Currently Amended) The apparatus according to claim 14 ~~6~~, wherein the second sensor comprises a giant magneto-resistive (GMR) sensor (26).

8. (Previously presented) The apparatus according to claim 4, wherein

a magnetic shield (96; 106) is provided between the first (30) rotary encoder and the second rotary encoder (48), in order to at least partially magnetically uncouple the first and second rotary encoders from one another.

9. (Original) The apparatus according to claim 8, wherein the magnetic shield (96; 106) is arranged adjacent the rotary element (42; 94).

10. (Previously presented) The apparatus according to claim 1, wherein

the first (30) and second single-turn rotary encoder (48) are arranged adjacent a shaft end (16; 20) of the shaft (14) opposite to an input drive end of that shaft (14).

11. (Currently Amended) The apparatus according to claim 1, ~~67~~ wherein the sensors (26, 46') of the first (30) and the second single-turn rotary encoder (48') are arranged on a common sensor carrier (106).

12. (Previously presented) The apparatus according to claim 1, ~~117~~ wherein

the common sensor carrier (106) is formed, at least locally, from a magnetically shielded material, in order to magnetically uncouple the sensors (26, 46') of the first and second rotary encoders (30, 48') from one another.

13. (Previously Presented) The apparatus according to claim 1, further comprising

an evaluation unit (34) which receives the output signals of the first and second rotary encoders (30, 48; 48') and generates a common output signal (35).